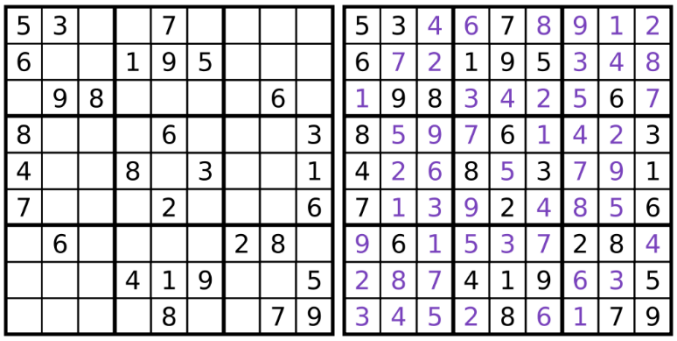
Sudoku Solver (Optimization)

Quoting Wikipedia : "Sudoku is a logic-based, combinatorial number-placement puzzle. The objective is to fill a 9×9 grid so that each column, each row, and each of the nine 3×3 boxes (also called blocks or regions) contains the digits from 1 to 9 only one time each. The puzzle setter provides a partially completed grid." The rules for an N^2 X N^2 sudoku are as follows:

1. The board is consists of N^2 rows and N^2 columns.
2. Numbers between 1 and N^2(inclusive) are to be filled in each row such that:
    1. All numbers in each row are distinct.
    2. All numbers in each column are distinct.
    3. All numbers in the sub-matrix having rows from (i*N + 1) to (i + 1)*N, and columns from (j*N + 1) to (j + 1)*N both inclusive, should be distinct. 0 <= i,j <= N-1. Rows and columns are 1 indexed. Each such sub-matrix is called a "box" or "region".



For this problem, you are required to solve a general N^2X N^2 sudoku puzzle. Given a partially filled sudoku board, you have to fill it in as "perfect" a manner as possible.

Input:

The first line contains N,K. The following K lines contain 3 numbers: x, y and d. 1 <= x,y,d <= N^2. This means that a number d is present on the board at position (x,y) 2 <= N <= 30 0 <= K <= N^4 At most 50% of the board will be covered at the start. All positions (x,y) in the input will be unique.

Output:

The output consists of N^2 rows having N^2 numbers each. Each number should be between 1 and N^2 (inclusive) and separated by a space. If the initial grid has a number d at position (x,y), then even the output should have the number d at position (x,y).

Scoring:

- For each row and every number K in the range 1 to N^2 that is missing from the row, incurs a penalty of 1.
- For each column and every number K in the range 1 to N^2 that is missing from the column, incurs a penalty of 1.
- Similary, for each box and every number K in the range 1 to N^2 that is missing from the box, incurs a penalty of 1.

A box (as explained above) is a N X N square and the grid can be divided into N^2 such non-overlapping boxes.

Example:

Input:

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2 4

1 2 1

2 4 4
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3 3 1

4 1 3
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Output:

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2 1 3 4

1 2 4 4

3 4 1 2

3 2 4 1
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Penalty:

(0 + 1 + 0 + 0) + (1 + 1 + 1 + 1) + (2 + 2 + 1 + 1) = 11